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ISCHEMIC STROKE – THE LIPID PROFILE IN WOMEN FROM SLOVAKIA

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Ischemic stroke – the lipid profile in women from Slovakia. – M. Mydlárová Blaščáková[1], Z. Malinovská[1], K. Partilová[1], V. Sedlák[1], J. Poráčová[1], V. Martonová[1], M. Majherová[2], L. Blaščáková[3], M. Konečná[1], Z. Gogaľová[1], J. Mydlár[4], L. Uhrínová[5], L. Bicáková[1] – *Ischemic stroke occurs due to failure of blood flow in the cerebral vessels and leads to a temporary or permanent damage to the brain tissue function. We measured anthropometric and physiological parameters in 50 women (25 women of control group – CG, 25 women with ischemic stroke – ISG), and we have set markers of lipid profile – CHOL, HDL, LDL, TRIGL. We found a statistically significant difference ($p<0.05$) in biochemical parameters CHOL, TRIGL, HDL between CG and ISG by using the Student's T-test.*

Key words: *Brain tissue, anthropometric and physiological parameters, biochemical analysis, stroke, Central Europe.*

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Ішемічний інсульт - ліпідний профіль у жінок зі Словаччини. – М. Мидларова Блашчакова [1], Маліновська [1], К. Партілова [1], В. Седлак [1], Я. Порачова [1], В. Мартонова [1], М. Майгерова [2], Л. Блашчакова [3], М. Конечна [1], З. Ґоґалова [1], Я. Мидлар [4], Л. Угрінова [5], Л. Біцакова [1] *– Ішемічний інсульт трапляється через припинення кровотоку в судинах мозку і призводить до тимчасового або постійного пошкодження функції тканини головного мозку. Ми вимірювали антропометричні та фізіологічні показники у 50 жінок (25 жінок контрольної групи – КГ, 25 жінок з ішемічним інсультом – ІІГ), нами встановлено маркери ліпідного профілю – CHOL, HDL, LDL, TRIGL. Було виявлено статистично значущу різницю ($p<0,05$) в біохімічних параметрах CHOL, TRIGL, HDL між КГ та ІІГ за допомогою Т-тесту Стьюдента.*

Ключові слова: *мозкова тканина, антропометричні та фізіологічні показники, біохімічний аналіз, інсульт, Центральна Європа.*

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Introduction

Cerebrovascular diseases are currently the third leading cause of death and the second leading cause of dementia and disability in the world. The cerebrovascular diseases include stroke, which is divided into ischemic (increased frequency of prevalence), and bleeding (Kumar et al. 2013). Ischemic stroke is the result of circulation disorders of cerebral blood vessels and it results in temporary or permanent impairment of brain tissue function.

The causes of ischemic stroke are particularly the blood vessels atherosclerosis, thrombosis and embolism (Ovbiagele et al. 2015).

Risk factors that influence the formation of ischemic stroke (IS) include obesity, smoking, lack of physical activity, stress, genetic predisposition, diseases − hypertension, diabetes and so on (Maas, Safdieh 2009 Bendok et al., 2011 Daroff et al. 2016).

Modern biochemical methods in medical diagnostics are based on the assumption that the origin of many diseases is the result of quantitative and qualitative chemical changes happening in the human body, which are reflected in the content or activities of various biomolecules (Mydlárová Blaščáková et al. 2013). With regard to lipid metabolism, a risk of IS is an increased level of LDL cholesterol, which is a major cause of atherosclerosis (Pendlebury et al. 2009). In connection with the IS, from biochemical markers in clinical practice are monitored other parameters of lipid profile: CHOL − total cholesterol, HDL cholesterol and triglyceride − triglycerides; inflammatory markers, proteins, ions (Na, K, Cl) and glucose (Jickling, Sharp 2011).

The aim of this work was to measure and statistically evaluate the selected anthropometric, physiological parameters and the concentrations of lipid markers (CHOL, TIGL, HDL, LDL), associated with a risk of ischemic stroke.

Material and methods

The examined group consisted of 50 women, who were divided into two groups − the control group (CG = 25 women) and the group diagnosed with ischemic stroke (ISG = 25 women). Each person completed the study voluntarily and gave written informed consent for the use of data and venous blood sample, the sample will be anonymous and only used for scientific research purposes. A venous blood sample was collected from vena mediana cubital into tubes with anticoagulant content. By centrifugation (Selecta R, Centronic BL II, Spain) of blood samples we separated blood serum, in which the lipid concentrations (CHOL, TIGL, HDL, LDL) were measured by a fully-automated biochemical analyzer Cobas e411 (Japan).

Blood pressure (BP) was measured by non-invasive method for patients at the point of brachial artery. In the blood pressure measurement aneroid pressure meter (RIESTER MINIMUS II) was used.

In the individuals we measured body weight on a digital personal scale DM-117 Dimarson, body height was measured by digital height meter (Soehnle), in light clothing barefoot as the average of two consecutive measurements. Consequently, data were taken from weight and height and we calculated body mass index – BMI using the formula: BMI = m / h^2, where m is the weight in kilograms and h is height in meters. The measured data were processed by programs Excel 2010 and Statistica ver. 10. The parameters were evaluated using the statistical characteristics of the position (diameter) and the variability (standard deviation). To determine the significance of differences between groups in the particular parameters we used Student's T-test. To determine a statistically significant correlation between two parameters we used Spearman's rank correlation coefficient.

Results and discussion

Table 1 shows the average values of selected anthropometric and physiological parameters (systolic and diastolic blood pressure) in both groups of women (CG and ISG).

Tab. 1: Average values of the selected anthropometric and physiological parameters in observed groups of women

Parameter	Average value ± SD	
	CG (n = 25)	ISG (n = 25)
Biological age (years)	69.84 ± 13.61	71.08 ± 17.63
BMI (m/h^2)	30.24 ± 6.42	26.97 ± 6.37
Systolic blood pressure (mmHg)	142.12 ± 29.46	137.60 ± 14.37
Diastolic blood pressure (mmHg)	78.48 ± 14.10	82.40 ± 10.62

Legend: BMI – Body Mass Index, CG – the control group of women, ISG – the group of women with ischemic stroke, SD – standard deviation

In the study group we found a higher average value of BMI index in the control group of women (30.24 ± 6.42 m/h^2) in comparison to ISG (26.97 ± 6.37 m/h^2). The average value of BMI index in women diagnosed with ischemic stroke is classified as the category of moderate overweight (25 – 29.99 m/h^2), the women in the control group belong to the category of obesity level I (30 – 34.99 m/h^2).

The risk of IS increases linearly with increasing value of BMI index (Kernan et al. 2015). Andersen and Olsen (2013) claim that in the adult the level of BMI index is > 30.00 m/h^2.

The average values of systolic blood pressure in both groups were not in line with the reference value (120 mmHg). The calculated average value of diastolic blood pressure was lower in CG (78.48 ± 14.10 mmHg) and the average value of diastolic

blood pressure in ISG was higher (82.40 ± 10.62 mmHg) than the reference value (80 mmHg). According to the American Heart Association (AHA 2016) hypertension is diagnosed with an increase in systolic blood pressure > 141 mmHg and diastolic blood pressure > 91 mmHg, regardless of gender. In this study, based on the calculated average value of systolic pressure (142.12 ± 29.46 mmHg), the women of CG could be included in the risk group with possible occurrence of hypertension.

By means of Student's T-test, we did not find any statistically significant differences in anthropometric and physiological parameters between the CG and ISG. From biochemical markers (Table 2) we focused our attention on the lipid profile (CHOL, TIGL, HDL, LDL).

Tab. 2: Average values of the selected biochemical parameters in observed groups of women

Parameter	Average value ± SD		p
	CG (n = 25)	ISG (n = 25)	
CHOL (mmol/l)	4.84 ± 2.28	3.25 ± 2.21	0.05*
TRIGL (mmol/l)	1.46 ± 0.78	0.95 ± 0.74	0.05*
HDL (mmol/l)	0.50 ± 0.18	0.72 ± 0.44	0.05*
LDL (mmol/l)	2.30 ± 1.26	1.73 ± 1.19	0.11

Legend: CG – the control group of women , ISG – the group of women with ischemic stroke, * – statistical significance, SD – standard deviation

We found that the calculated average values of lipid markers CHOL and TRIGL were observed in both groups (CG and ISG) in accordance with the reference values. The calculated average values of HDL and LDL cholesterol in CG and ISG are not in accordance with the reference values, which are presented by Winter et al. (2008). We assume that our surveyed sample consisted of a small number of individuals (50 in total), and we did not take into account medical treatment, or circadian rhythms.

Through Student's T-test, we found a statistically significant difference between CG and ISG in the biochemical parameters CHOL, TRIGL, HDL.

Mahmood et al. (2010) in their scientific study dealt with the determining of the lipid concentrations in individuals with ischemic stroke in Pakistan. Studied group consisted of 100 subjects of both sexes, whose average age was 64.20 ± 12.00 years. The average values of concentrations of lipids were: CHOL − 5.08 ± 1.48 mmol / l, TRIGL − 1.22 ± 0.30 mmol / l, LDL − 4.46 ± 0.33 mmol / l, HDL − 0, 86 ± 0.30 mmol / l. The authors evaluated that in the patients with sudden stroke there occurs a slight increase in the concentration of total cholesterol in comparison to the reference values (CHOL < 5.8 mmol / l). Based on these results, the authors recommend regular screening of the lipid profile in the subjects with obsolete IS to improve the treatment and prevention of further strokes. Comparing our results with the results of the study by Mahmood et al. (2010), we found that the calculated average concentration of CHOL and TRIGL in the group of women with IS was lower. On the contrary, the calculated mean concentration of LDL and HDL cholesterol was higher in the group of women with IS in our study than the calculated average concentration of LDL and HDL in the study by Mahmood et al. (2010). We expect that it could be affected by the size of the reference file, a different population, gender and possibly by the use of medicamentous treatment.

Shamai et al. (2011) observed an association between BMI values and the concentration of lipids in the blood. Study took place in Florida for four years. The sample consisted of 637 patients of two categories: obese individuals whose BMI value was > 30 kg/m^2 and healthy individuals with BMI value ≤ 30 kg/m^2. The age and gender of the individuals were irrelevant. The authors did not find any significant association between high value of BMI (>30 kg/m^2) and the concentration of LDL ($p = 0.07$). In their study they found a significant association between high value of BMI and HDL ($p < 0.001$) and between BMI and TRIGL ($p < 0.005$). The authors found that the association of BMI with HDL and triglyceride may be associated with insulin resistance. In our examined group of women, we found a statistically significant association ($p < 0.05$) between BMI and TRIGL.

Significant relation between BMI and LDL, which is the main cause of atherosclerosis by Pendlebury, Giles and Rothwell (2009), was not confirmed in our study, even in the scientific study by Shamai et al. (2011).

Conclusion

In this work we dealt with the selected biochemical markers of lipid profile and their association with anthropometric and physiological

parameters. We found statistically significant association ($p < 0.05$) between BMI and TRIGL, and we have also confirmed the statistical significance of the differences between the biochemical parameters of CHOL, TRIGL, HDL between CG and ISG.

The calculated average values of biochemical parameters CHOL, TRIGL, HDL were higher in CG than in ISG. These results cannot be interpreted directly, it is necessary to take into account the biological variability conditioned by circadian rhythms, seasonal factors, diet and genetic predisposition. We assume that the results could be affected by the size of the reference group, different population, sex and probably the use of drug treatment.

The incidence of stroke in the Slovak Republic has been increasing. The overall incidence of stroke per year is about 300 to 500 cases at one hundred thousand inhabitants, in individuals over 65 years, the incidence of 4000 − 7000 cases on hundred thousand inhabitants (Šustová 2013).

Given that the incidence of stroke is increasing, it is necessary to give attention to this syndrome, also focus on the impact of risk factors, early diagnostics (of biochemical markers, genetic predisposition) and treatment.

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